

NEWS OF BRAZILIAN SPACE ACTIVITIES

Instituto de Pesquisas Espaciais  
Sao Jose dos Campos, Brazil



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## A VIZIR (VISUALIZER OF INFRARED AND VISIBLE IMAGES) FOR METEOROLOGY

At the beginning of June, the INPE (Space Research Institute) /1\* received a VIZIR system to produce meteorological pictures, designed and developed by the French company Societe Europeenne de Propulsion (SEP).

The system (Visualisateur d'Images Infra-Rouges et Visibles) will permit the production of pictures of high quality. It is still in the installation phase, near the SMS satellite reception station.

To operate the equipment, two researchers of the INPE Department of Meteorology were sent to the SEP itself for training. The course lasted 30 days, and consisted of operational training and details of planning and development.

### The VIZIR System

The characteristics of the system allow the production of pictures of 400 x 400 mm, with a capacity of 15,000 points per line and 15,000 lines per picture. The execution of these pictures is of high quality, since the system has a laser-based optical subsystem and a subsystem of electromagnetic bearings. The picture reception lasts for nearly 18 minutes, with a radiometric resolution of 256 tape levels.

It is meant in particular to receive data from the SMS satellites, in all modes of operation, without any modification in the final size of the picture. The equipment also has processing units for the reconstruction of pictures recorded on magnetic tapes. This picture reconstruction capacity is of the order of 1,000 lines per minute.

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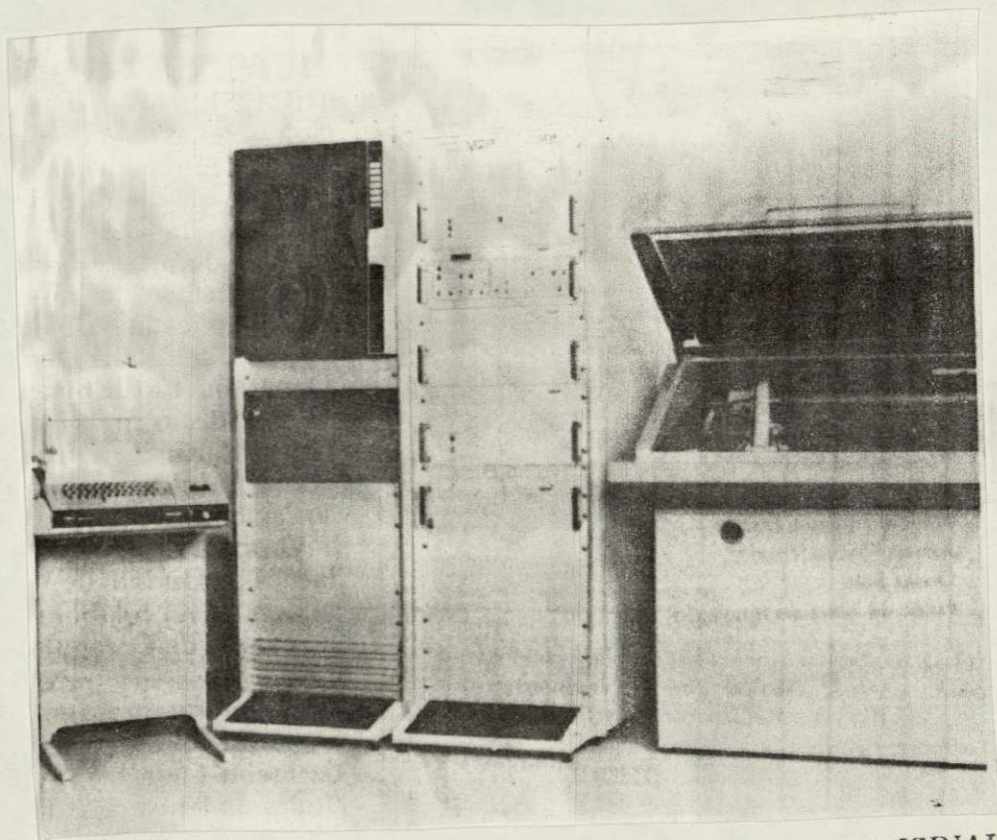
\* Numbers in the margin indicate pagination in the foreign text.

The applications of VIZIR relate to the production of pictures in the visible and infrared spectra for application in Space Meteorology and Remote Sensing.

The pictures will be reproduced in black and white, but in the future they might be obtained in fictitious color, since the equipment allows the installation of two more lasers of suitable spectral range.

To obtain the electromagnetic infrared spectrum, the data recorded are on magnetic tapes of 1,600 bpi capacity. For the visible region of the spectrum, the data are received in real time. The meteorological satellites used will be the SMS GOES and METEOSAT. It may also be possible eventually to receive pictures also from the TIROS-N satellite, which has 4 daily and 4 nightly passages, transmitting data on 5 channels.

The system will be used for the Applied Meteorological System, while it may be useful for various other research programs of INPE, for example, for Maritime Resources.





## SMS PICTURES ANALYZED IN THE I-100

The researchers of the Meteorology Department of the INPE (Space Research Institute) are carrying out final tests to implement a technique to enhance pictures in the infrared. This technique permits, with the use of the Automatic Image Analyzer (I-100), a better quantitative analysis of the pictures transmitted by the meteorological satellites.

The enhancement of pictures in the infrared is a process consisting in the expansion of the tape scale within certain temperature ranges. By means of this process it will be possible to identify clouds with many details, also the superficial thermal characteristics in continental and ocean regions. In a normal infrared picture, this type of identification is not always possible, especially when the temperature gradients are not great.

The technique was adopted some time ago, but the INPE was only able now to make use of it for its investigations in various areas of application.

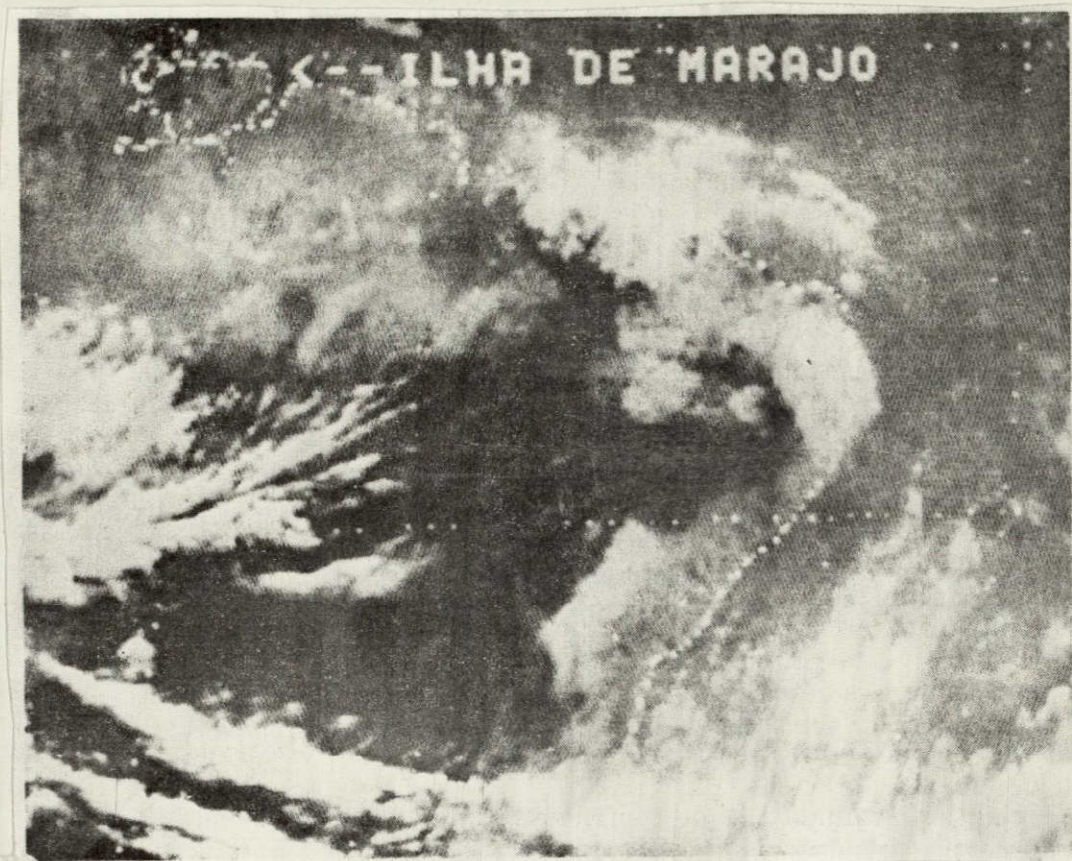
### Applications

The technique of implementation, because of the high precision of the data in the areas which are to be studied, allows applications mainly in the area of Meteorology, for example the detection of areas with convective activities (development of clouds and analysis of their structure), estimates of the level of the precipitation, short term weather forecast (a few hours ahead).

In Oceanography, another area of application for infrared pictures with enhancement, this process may be used to identify maritime currents, the phenomenon of resurgence and the occurrence of whirlpools in the ocean.



In agriculture, the technique is useful in case of frost to supply in almost real time the thermal map of the surface, permitting the identification of areas most affected.



Marajo Island

NEWS

/2

Eighty trainees of the Association of Diploma Holders of the Higher Military Academy (Adesg) of Brasilia visited INPE last August 8th. They were received by Dr. Ivan Costa da Cunha Lima, who welcomed them in the Director's name.

The program of the visit consisted in a series of talks on the

activities of the Institute, given by the Department heads.

The visit to the Institute is part of a program of visits which the committee arranged to various research institutions in the country, such as the University of Campinas, the University of Sao Paulo, the Technical Aerospace Center, the Brazilian Aeronautics Company and others.

Visiting the INPE on June 19, Mr. Mario Hernandez of IBM of Mexico was accompanied by Messrs. Carlos Humes (IBM/SP), Mauricio Serbrinic (IBM/SP), Raul E. G. (Braga (IBM/BSB) and Solon Benayon da Silva (IBM/RJ).

The program of the visit consisted in showing in the morning all the research programs in the area of Information, taking place in the Institute, including a talk on the post graduate Applied Computer course. The talk was given by the researchers of the Information Division of the INPE Space Systems Department.

In the evening, Mr. Mario Hernandez arranged for the presentation of the Research Center for Processing of Pictures and Applications to Remote Sensing, of IBM of Mexico.

The purpose of the visit was to know the installations of the Information Division, with a view to the possible collaboration between the two countries in the area of Applied Computer Technology.

The titular professor of the Sao Paulo University, Dr. Jose Manuel Riveros, of the Chemistry Institute of the USP, visited the INPE to conduct a seminar for the group of the Space Science Department on June 21.

The area discussed was the "Study of Ion-Molecule Reactions in the Gaseous Phase by Cyclotronic Ion Resonance." About 30 people

attended the meeting, much appreciated by the Combustion and Ionosphere Groups.

Their Symposium on Climate and Deforestation, held at the Federal University of Rio de Janeiro, from June 4 to 8, was attended by the researchers Vitor Celso de Carvalho, Magda Adelaide Lombardo and Juan Jose Verdesio Bentancurt of the INPE Department of Remote Sensing.

The Space Research Institute was authorized to sign, in the person of its Director, Dr. Nelson de Jesus Parada, a purchase contract with the Empresa Brasileira de Aeronautica (EMBRAER).

The object of the contract will be an aircraft EMB-110B1 for use in air survey flights and remote sensory research over the Brazilian territory.

The contract, which bears the number 006-COV will involve FINAME financing (Financing for Acquisition of Machines and Equipment). The aircraft is to be delivered to INPE for effective use by July, 1980.

The current INPE aircraft was the first EMB-100A manufactured by EMBRAER, still in prototype phase, and the third manufactured in Brazil of this line. It will be decommissioned when the new model arrives.

The EMB-110B1 aircraft is being prepared to operate with a metric camera, a multispectral camera and a scanner, simultaneously in the standard version, or other sensors acquired or developed by INPE. It will have a flight range of 5 hours, 30 minutes, and will carry a crew of 2 navigator pilots, up to 3 sensor operators and a director.



## Courses, Lectures and Meetings

### The CNPq (Research Commission) of the INPE Will Take Part in the 1 FENAESP

The First National Fair of Aeronautics and Space (FENAESP), which is expected to be held between October 15 and 23 of this year, will be organized in Hanger ~~x~~ 30 of the Aerospace Technical Center (CTA) of the Ministry of Aeronautics, in Sao Jose dos Campos and in the parking area of the above mentioned hangar.

Public and private organizations interested in the aerospace sector will exhibit products manufactured by them and/or representative Brazilian services.

The INPE will take part in the First FENAESP, setting up a "stand" which would represent all the areas of activities of the Institute.

The Remote Sensing Department of the INPE offered a training course to 5 officials of the Division of Geographic Services (DSG) of the Ministry of the Army, from last June 4th to June 8th.

The training consisted in an introduction to the basic principles of remote sensing, and theory on the visual interpretation of the LANDSAT pictures. The greatest emphasis was laid on the practical part of the training, on the use of the satellite pictures for purposes of cartography and geodesy.

To supplement the theoretical studies of the training, the group of officer trainees went to Cachoeira Paulista, visiting the laboratories of electronic and photographic processing of pictures of the Department of Production of Pictures.

The Division of Geographical Service has been a user of the LANDSAT data for some time, and sends, from time to time, a team to

the INPE for courses of training and updating in the analysis and interpretation of data.

From May 28th to June 1st, a team of 5 technicians of the Department of Remote Sensing visited Cuiaba, Mato Grosso, to give a training course in remote sensing techniques at the orbital level.

The course was provided for an audience of 25 technicians of the following institutions: Brazilian Forestry Development Institute (IBDF), Federal University of Mato Grosso, Department of Highways of the State of Mato Grosso (DERMAT) and Metais Mato Grosso S/A (METAMAT).

The course, which was sponsored by the Federal University of Mato Grosso, was an intensive one. It concerned the application of remote sensing techniques (at the orbital level) to the survey of natural resources (vegetation, soils, geology, cartography, geodesy).

The same team of the INPE Department of Remote Sensing, organized, also in Cuiaba, a seminar on the utilization of the LANDSAT system in the survey of natural resources, on the 29th, 30th and 31st of May.

The audience of 150 consisted of teachers, students, and administrative personnel of the RONDON project of the Ministry of Education.

The purpose was to spread the application of this methodology and to impart to those concerned in the RONDON project a modern view of the method of carrying out the survey and control of natural resources.

The Oceanography Group of the Department of Remote Sensing (SERE) of the INPE (National Space Research Institute) completed a study which had taken more than five years. The Atlas of Oceanographic Structures of the Southeast Coast of Brazil for Remote Sensing Studies is now ready for publication.

In the provisional edition issued by the INPE, the study was divided into two volumes. One of them contains the description of the objectives, the methods used, the source of information and a series of 164 statistical tables on the oceanographic parameters: salinity, temperature, oxygen and nutrients for 8 months of the year, excluding the months of March, April, May and June, for which no statistically significant data are now available. It seems that the want of data for these months is a coincidence.

This edition has already been circulated to the main organizations concerned in this area, such as the Hydrography and Navigation Board (DHN) of the Ministry of the Navy, the Santos Fisheries Institute, the Oceanographic Institute of the Sao Paulo University (IOUSP) and the Office of the Superintendant of Development of Fisheries (SUDEPE), which are already using it as a source to consult for activities relating to fisheries on the southeast coast of Brazil. Keeping in mind the fact that oceanographic data are difficult to obtain, the Atlas will be very useful as a source of basic data for many years.

### Details

Volume I of the Atlas is a cartographic tridimensional description of the basic structures of the southeast coast of Brazil, and represents the basic element of one of the objectives to determine the areas favorable for fisheries. For the rest, it may be stressed that its basic objectives are:

to obtain a detailed cartographic description of the tridimensional structures of the waters, to be applied in the interpretation of orbital oceanographic data collected by remote sensors; to obtain the basic oceanographic charts to establish fisheries maps, to acquire knowledge on the conventional procedure to obtain, establish and interpret oceanographic data; to supply statistical data on the oceanographic parameters, in the northern, central and southern areas of the region studied, intended for fisheries experts; to furnish oceanographic data in cartographic form for general oceanographic use.

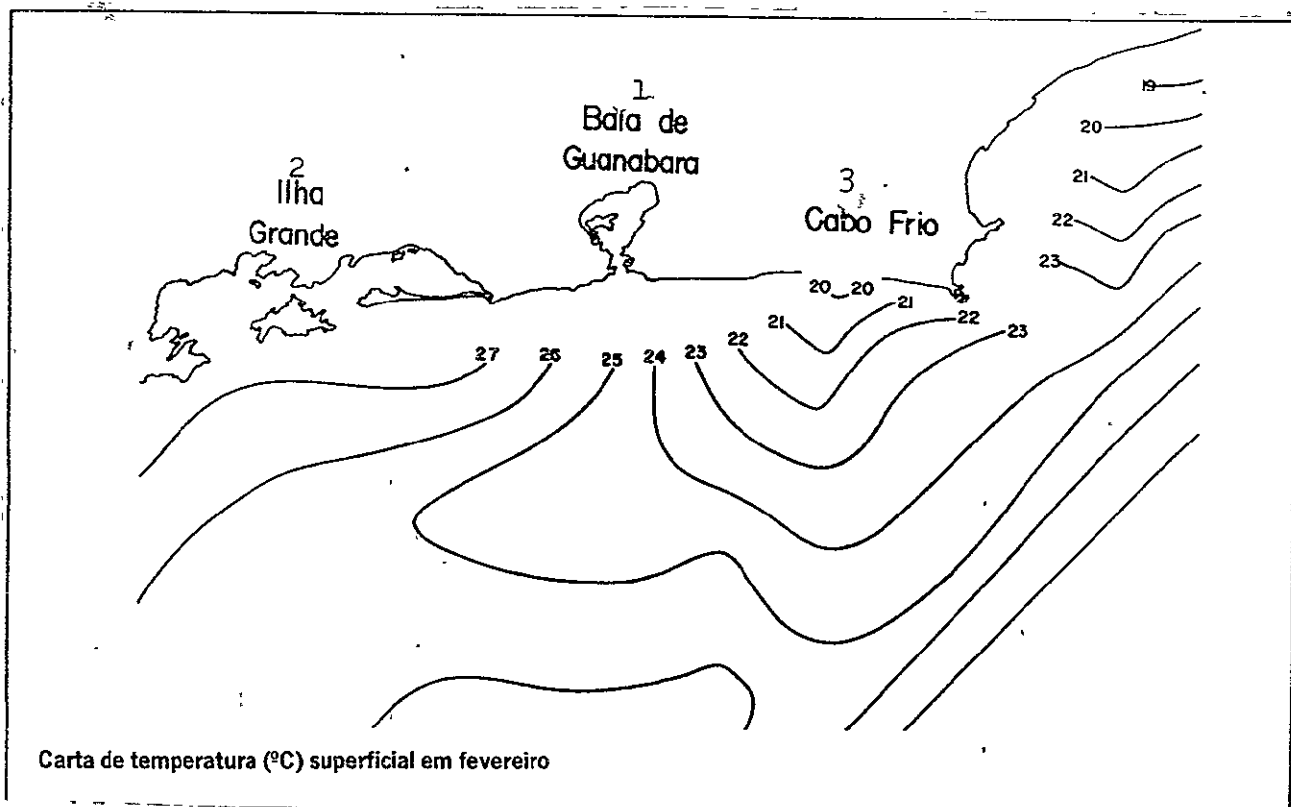
The data on which the maps are based and the profiles of the Atlas, are those corresponding to 1696 oceanographic stations established up to now on the southeast coast of Brazil, in an area defined by the map number 23,900 of the DHN. The bathymological map, the map of the bottom, is perhaps the most valuable of nearly 200 maps, and is based on 1805 geological stations, with sampling of the nature of the bottom of the sea, according to the registers of the National Oceanographic Data Bank of the DHN.

Most of the data are collected by the oceanographic ships of the DHN and IOUSP.

To better describe the structures of the waters and the statistical values of the parameters, the region of the Cape from Sao Tome to Itajai was divided into three regions: Northern Area (AN), Central Area (AC) and Southern Area (AS). In turn, these are divided into three sub-areas: Continental Platform, Slope and Abyssal Zones.

Volume II contains the maps of salinity, temperature, oxygen and nutrients, from a depth of 0 meters (surface), 50 meters and bottom, and the corresponding profiles, altogether 67 of them.





Surface Temperature Map ( $^{\circ}\text{C}$ ) in February

Key: 1 - Guanabara Bay  
 2 - Island  
 3 - Cape

## COURSE FOR THE INTERPRETATION OF METEOROLOGICAL SATELLITE PICTURES

The INPE (Space Research Center) is organizing, from November 12th to December 8th, a course for the Interpretation of Meteorological Satellites for the purpose of sharing with professionals in this sector the experience acquired by the Department of Meteorology of the INPE.

The course consists of the programming circulated by the World Meteorological Organization ("Compendium of Meteorological Training Facilities," WMO No. 240, Fifth Edition, 1977) and is offered periodically by the INPE. It will last 4 weeks with daily schedules of 8 hours. It will be given in Portuguese, and consist of three main parts: obtaining data (systems); utilization of data (interpretation) and operational practice (technique).

The lectures will be held in the INPE establishments in San Jose dos Campos.

The organizations who wish to send candidates would have to apply by October 15, 1979, to:

Space Research Institute  
Department of Meteorology  
Post Box 515  
12200 Sao Jose dos Campos, SP

The candidates must have a university degree, preferably in a correlated area, or equivalent experience.

The registration is free and the number of places restricted to fifteen (15).

The candidates will be accepted strictly in chronological order of application.

### Program

#### Part A

1. Principles of Orbital Theory
2. Forecasting Orbits and Tracking
3. Graduation

#### Part B: Obtaining Data

1. Present Satellites
2. Low Orbit Meteorological Satellites
3. Geostationary Meteorological Satellites
4. Image Producers
5. Circulation
6. Operational Systems and Future INPE Programs

#### Part C: Utilization of Data

1. Data Supplied by Meteorological Satellites
2. Elementary Cloud Analysis
3. Atmospheric Systems

Jose Augusto de Carvalho Cunha "System of Control of Stocks" ("SICE"). Research work. Guide: Dr. Joao Mello da Silva. Associate Guide: Dr. Ralf Gielow.

In this study it is proposed to use the computer as a means to be applied to achieve the best solution of the existing problems in Systems of Planning and Programming of Production and Control of Stocks. The techniques developed in "Material Requirements Planning MRP" are used to give the management a valuable tool for the decision making process, permitting, among other things, a better work flow, a study of the economic appraisal of operational alternatives and an estimate of the financial capacity needed in the future. A comparison is also made with a known minimum stock system, the "Order Point System," through a computer simulation of a manufacturing process, using real data obtained in the Empresa Brasileira Aeronautica, EMBRAER, resulting in considerable reduction of the costs presented in the MRP.

#### Electronics and Telecommunication

Paulo Faria Santos Amaral: "Computer Assisted Microcontrol Memory Emulator". Thesis Guide: Dr. Eduardo Whitaker Bergamini.

The purpose of this study is to present the planning and simulation of a very useful system for support in microprogramming. It may be operated under the control of the operational system of the HP2116B microcomputer or an independent means of operation. The system permits a user to load, test, modify and correct a microprogram in its real time background, and accomplish the diagnosis and maintenance of the final prototype. Once a microprogram is correct, the system arranges a punched paper band in such a manner that it may be loaded directly in a PROM type memory by a PROM programmer.



## Meteorology

Nelson de Jesus Pereira: "Effects of the Release of Latent Condensation Heat on the Development of Disturbances at Medium Latitudes!" Thesis for Master's Degree. Guide: Dr. V. B. Rao.

The effects of the release of latent condensation heat in the development of disturbances at medium latitudes are discussed in this study using initially the quasi-geostrophic two-path model. By means of the classical method of eigenvalues, the main characteristics of instability, the vertical structure and the energy transformations of unstable disturbances are studied. The results found show the existence of another type of disturbance, called medium-scale disturbance. Since these perturbations have short wavelengths, the validity of the quasi-geostrophic approximation becomes doubtful. Thus, he subsequently uses a non-geostrophic or balance model. The analysis of the instability, the vertical structure and energy transformations reveal that the release of latent condensation heat is fundamental to the formation of the disturbances of medium scale. It was also observed that these disturbances have a characteristic length of approximately 1000 km and are confined to low levels.

## Remote Sensing

Sydneya Maluf: "Fisheries Map: A Model of Fisheries Maps Using Oceanographic and Remote Sensing Data. Applied to Sardine Fishing (*Sardinella Brasiliensis*)". Research Study. Guide: Commander Emmanuel Gama de Almeida.

This study represents a methodology based on remote sensing to determine the areas most suitable for sardine fishing, in the area located between the latitudes  $21^{\circ}45'S$  and  $25^{\circ}00'S$  and longitude  $40^{\circ}50'W$  and  $47^{\circ}00'W$ , on the southeast coast of the South Atlantic. By means of this procedure, a Fisheries Map Model was developed

using the average monthly data on surface temperature, salinity, oxygen and phosphate, associated with those of sardine fishing, for the months of July, August, September, November and December. The Fisheries Maps contain the areas most favorable for sardine fishing, shown for these five months.. This proves the potential of the thermal infrared VHRR pictures, from the satellites of the NOAA series to assist in determining these areas. It also gives correlations between the oceanographic parameters and the catching of sardines, established by programs for the Burroughs-6700 computer of the Space Research Institute (INPE).

### Technology of Education

Luiz Antonio Cerqueira Burckauer: "Manual of Arts for TVE"  
Research Work. Guide: Maria Biscaro Costa Barbosa, MSc. Associate Guide: Olívar Maximino Mattia, MSc.

The study is divided into 2 parts: The first provides an academic focus in terms of justification, objectives, definition of clientele influencing the establishment of the manual as a means of personnel training.

Part II is presented as an Appendix and presents the Manual on Visual Arts, proper, planned in such a way as to serve as an orientation recourse especially for persons involved in the process of preparation and production of visual and material used in the recording of programs for Educational Television.

It shows different aspects of Psychology, Education and Communications in an organized way, making it simpler for the user to find material for optimizing work in the field of education.

Theory, experience and suggestions for implementation appear in a practical and functional form, not simply as a manner of presenting data, but also reinforcing the concept of co-responsibility which should exist in a TVE production team.

Vera Conceicao Beraldo de Oliveira: "A Model for the Development of Teaching Material for Television". Research Study. Guide: Dr. Vathsala I. Stone.

The main purpose of this study is to present a model of training appraisal for developing materials for educational television. The implications and processes, such as the medium of mass education and the model of appraisal impose the obligation of studying the structure and development of the teaching plan. The plan for transmission and reception of the program permitting the assessment of the evaluation has also been established.

#### SBPC PARTICIPATION

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The Thirty-First Annual Meeting of the Brazilian Association for the Progress of Science (SBPC) was held this year in Fortaleza, Ceara, from the 11th to the 19th of July, and was attended by 28 INPE researchers.

On this occasion, the researchers of this Institute presented altogether 64 papers in the areas of Agronomy and Animal Husbandry, Architecture and Town Planning, Computer Technology and Simulation, Engineering and Technology, Electrical Engineering, Physics, Environmental Pollution, Astronomy, Geophysics, Geology, Geography, Meteorology and Oceanography.

We publish here the titles and authors of the papers of the INPE researchers which were presented at the meeting.

#### 1. Applied Sciences

##### Agronomy and Animal Husbandry

"Appraisal of Reforested Areas of the Buri Municipality by

Automatic Evaluation of LANDSAT Pictures;" Pedro Hernandez Filho, Yosio Edemir Shimabukuro and David Chung Liang Lee.

"Effects of Climate on the Technology and on the Productivity of Maize for the DIRA of Ribeirao Preto," Sherry Chou Chen and Lourdes Bernadette da Fonseca.

"Extraction of Spectral Signature of Soybean and Cereal Crops from Satellite Imagery for Testing in a Yield Prediction Model," Dal Arthur Cottrell.

#### Architecture and Town Planning

"Creation of District Centers in Vacant Areas," Adalton Paes Manso.

#### Computer and Simulation

"Induction of Rules of Decision," Orion de Oliveira Silva.

#### Engineering and Technology

"Data Collecting Platform, Spatial Technique of Telemetry Applied to the Recording of Environmental Paramters," Jose Roberto de Oliveira.

"Satellites, Their Evolution and Importance for Atmospheric and Ecological Sciences," Marlene Elias.

#### Electrical Engineering

"Pulse Amplitudê Analyzer for Space Applications," Renato Senador and M. A. Mariano da Silva.



"Communications of Multiple Access with Different Return Signals," Aydano Barreto Carleial.

"Frequency Converter for a Low Range Ground Station," Lucio Baptista Cividanes.

"Coherent BPSK Demodulatôr," Janio Kono.

"Determination of the Field Induced by a Paraboloid Due to a Plane Axially Incident Wave," Lucio Baptista Cividanes.

"Determination of the Phase Center of Feeders of the Corrugated Conical Horn," Carlos Alberto Iennaco Miranda and Carlos Eduardo Santana.

"Low Cost Ground Stations to Receive High Resolution Meteorological Pictures," Carlos Eduardo Santana, Wilson J. Fleming, Jose R. de Oliveira, Valter Rodrigues, Luiz F. Munoz and Francisco E. de Carvalho Viola.

"High Stability Programmable FM Modulator Using Frequency Synthetization," Wilson J. Fleming.

"Error Tolerant Synchronization for the Reception of Signals Coded in PCM, and Transmitted by Geosynchronous Meteorological Satellites," Valter Rodrigues.

"Numerical Solution of Uniform Waveguides by the Method of Finite Difference Method," Pawel Rosenfeld and Luiz Alberto de Campos Melo.

## 2. Science of Matter

### Physics

"Solâr Cells; Space and Ground Applications," R. Ranvaud.

"Conversion of Electromagnetic Energy Into Thermal Energy in the Photoacoustic Effect," Marcus Antoniûs Andrade, C. Siqueira, Cesar C. Ghizoni.

"Study of the Dependence of the Lifetime on the Thickness of Semiconductor Films," Marcus Tadeu Pacheco, Cesar C. Ghizoni.

"The Problem of Magnetic Impurities Through a Wolff Hamiltonian," Keung-An Chao, R. Kishore, I. C. da Cunha Lima.

"Thermodynamic Properties of Amorphous Heisenberg Ferromagnets," R. Kishore, I. C. da Cunha Lima, M. C. Forti.

"Spin Waves in Itinerant Antiferromagnets," Ram Kishore.

### 3. Environmental Sciences

#### Environmental Pollution

"Application of Remote Sensing to the Study of the Dispersion of Atmospheric Pollutants," Alberto Setzer and Luiz Carlos Baldicero Molion.

### 4. Sciences of the Earth and the Universe

#### Astronomy

"Background Radiation for a Gamma-Ray Astronomy Balloon-Borne Ge (Li) Spectrometer at 12 GV"; J. M. da Costa and S. L. G. Dutra (INPE/CNPq, Brazil); D. Boclet, Ph. Durouchoux and R. Roccia (Dph/EP/ES, Saclay Nuclear Research Center, France); F. Alberne, J. F. Le Borgne and G. Vecrenne (Space Radiation Research Center, France).

"Building of a Telescope for Low Energy Gamma Ray Astronomy," Jeronimo O. D. Jardim, O. D. de Aguiar, I. M. Martin and K. R. Rao.

"Emission of X-Rays Associated with a Black Hole in a Dense Cloud of Interstellar Medium," Elesbao G. de Souza.

"High Resolution Measurements of Gamma-Ray Lines from the Direction of the Galactic Center"; J. M. da Costa and S. L. G. Dutra (INPE/CNPq-Brazil); D. Boclet, Ph. Durouchoux and R. Roccia (DPh/EP/ES, Saclay Nuclear Research Center, France); F. Alberne, J. F. Le Borgne and G. Vedrenne (Space Radiation Research Center, France).

"Nuclear Gamma Lines Produced in Supernovas and Possibility of Detection," Jeronimo O. D. Jardim.

"Perturbation Method in the Study of Interaction of Solar Wind with the Comets," Rene A. Medrano B.

"Observation of Nuclear Gamma-Ray Lines of Extra-Terrestrial Origin Using Stratospheric Balloons," K. R. Rao, J. O. D. Jardim and I. M. Martin.

"The Effect of Freezing in Space Plasmas," Rene A. Medrano B.

"Short Periodicities in the Occurrences of Active Solar Projections," K. R. Rao.

"Simulation of the Orbit of an Artificial Satellite Around the Earth, and Observations Made by the Tracking Stations," Ricardo Negreiros de Paiva.

"Spectrum of Diffuse Gamma Radiation from Balloon Observations," K. R. Rao, I. M. Martin and J. O. D. Jardim.

"The Positron Annihilation Line at 51 KeV in the Upper Atmosphere"; F. Alberne, G. Vedrenne (Space Radiation Research Center, CESR); I. M. Martin (INPE/CNPq).

## Geophysics

"Comparison Between the Prediction for HF Propagation and Data Obtained by Ion Probe," Ivan J. Kantor and Eurico Rodrigues de Paula.

"Concentration of Nitrous Oxide and Ion Production Rates in the Lower Ionosphere Determined by Using Ion Composition Data Obtained with Rockets," Inez. S. Batista and M. A. Abdu.

"Effects of the Vertical  $E \times B$  Plasma Drift Velocity on the OI 6300A Emission at the Magnetic Equator," J. A. Bittencourt and Y. Sahai.

"Study of the Electrostatic Oscillation in the Heated Ionospheric Plasma Observed in the Spectrum Near the Electron Gyrofrequency of Arecibo Incoherent Scattering," Y. Nakamura.

"Longitudinal Gradients in the Characteristics of the Equatorial Electric Stream in the Region of South America," R. P. Kane and N. B. Trivedi.

"Wave-Particle Interactions in the Brazilian Magnetic Anomaly," W. D. Gonzalez Alarcon, A. L. C. Gonzalez and S. L. G. Dutra.

"Solar and Lunar Tides in the Region of South America during the Magnetically Calm and Disturbed Periods," N. B. Trivedi and R. P. Kane.

"Measurements of Low Energy Gamma Rays in the Atmosphere of the South of Brazil," I. M. Martins, K. R. Rao, J. O. D. Jardim, J. M. Da Costa and S. L. G. Dutra.

"Magnetotelluric Measurements in Eusebio, Fortaleza, Ceara," N. B. Trivedi.

"Mesospheric Ozone from Measurements of Ground Based Sodium

Sounders," Volker W. J., H. Kirchoff, B. R. Clemesha and D. M. Simonich.

"Observations of Nuclear Lines With Stratospheric Balloons,"  
N. A. Bui Van, K. R. Rao, I. M. Martin.

Perturbations in the Nocturnal Thermosphere and Its Phase  
Velocities at the Center of the Brazilian Geomagnetic Anomaly,"  
J. H. A. Sobral, M. A. Abdu, I. S. Batista and Y. Sahai.

"Variation of the Intensity of the Annihilation Line 0.511  
MeV in the Atmosphere ( $23^{\circ}\text{S}$ ) as a Function of the Altitude," J. O. D.  
Jardim, K. R. Rao, I. M. Martin, J. M. da Costa and S. L. G. Dutra.

"Variation of the Flux of Charged Particles (0.3 MeV) as a  
Function of the Altitude at the Latitude of  $23^{\circ}\text{S}$ ," J. O. D. Jardim,  
I. M. Jardim, K. R. Rao, J. M. da Costa and S. L. G. Dutra.

### Geology

"Geological Profiles of the Oriental NE," Edison Crepani and  
Paulo Roberto Martini.

### Geography

"Comparative Study of the Data on Urban Areas Obtained With  
the Use of Aerial Photos of LANDSAT Pictures," Celina Foresti.

"Tres Marias Reservoir: Geomorphological Division," Tania Maria  
Sausen.

"Use of Orbital LANDSAT-1 Data for Classification of the Use  
Urban Territory of Sao Jose dos Campos," Madelena Niero.

## Meteorology

"Effect of Albedo and Topography on Atmospheric Circulation Over the North-East," Manoel Francisco Gomes Filho and Antonio Divino Moura.

"Effects of the Release of Latent Condensation Heat on the Development of Perturbations at Medium Latitudes," Nelson Jesus Ferreira and Vādlamudi Brahamananda Rao.

"Measurements of Intensity and Direction of Stratospheric Winds (30-45 km) in the Equatorial and Tropical Region of the Southern Hemisphere," I. M. Martin.

"Numerical Forecast of the Weather and Its Prospects in Brazil," Marco Antonio Maringolo Limes and Antonio Divino Mouro.

"A Synoptic Study of Tropical Disturbances in the Amazonian Region," Mary Toshie Kagano and Vernon Edgar Kousky.

"Use of Pictures Transmitted by Meteorological Satellites," Nelson Jesus Verreira and Vernon Edgar Kousky.

## Oceanography

"Photographic Detection of Oil Spills," Carlos Alberto Steffen.

"The Far East of the Subtropical Convergence of the Atlantic Ocean According to the Satellites Nimbus V and NOAA 5 and Oceanographic Data in 1973 and 1978;" Hector Manuel Inostroza Villagra (INPE/CNPq) and Emmanuel Gama de Almeida (DHN/INPE).

"Remote Sensing Applied to A Fisheries Map Model," Sydnea Maluf.

AGREEMENT BETWEEN THE INPE NATIONAL RESEARCH COMMISSION AND IDBF  
ON CONTROLLED DEFORESTATION

26

For the purpose of appraisal of deforested areas and preservation of park areas, within the territory of Amazonia Legal, and the implementation of reforestation of the regions of the State of Mato Grosso do Sul, an agreement was signed between the Space Research Institute (INPE) and the Brazilian Forest Development Institute (IBDF).

Deforestation Project

The project consists in the quantitative appraisal of the deforested areas of the entire Amazonia Legal, using pictures of the LANDSAT satellite in two different periods: 1973-1974 and 1977-1978. There are 234 points, corresponding to an area of 4,900,000 km<sup>2</sup>. The result of this work will be consolidated in maps in the scale 1:500,000 where the areas studied will be shown, also its subdivision into hectares.

Reforestation Project

The object is to survey the reforested areas of the State of Mato Grosso do Sul, by studying the spectral, spatial and temporal characteristics of the LANDSAT satellite. Twenty-two pictures of channels 5 and 7 are used on the scales 1:250,000 and 1:1,000,000, and false color picture (infrared) on the scale 1:500,000.

The area of concentration of reforestation covers approximately 300,000 hectares and is located on the Campo Grande/Tres Lagoas axis.

Park Project

The object of this project is to develop a procedure to use the MSS/LANDSAT pictures to characterize the natural conditions of the



Forestry Reserves.

The pilot area chosen to test this procedure was the Amazonia National Park (Tapajos), in which studies were made to characterize the plant cover, the geology and geomorphology by visual interpretation of the pictures obtained.

### Work

Before starting the work, in March 1979, 10 IBDF forestry engineers were sent to INPE to become acquainted with the procedure. The course consisted of two parts: the first on the theory of remote sensing, and the second a practical exercise using satellite pictures for interpretation, this direction being aimed in the direction of the proposed study. To implement the studies effectively, the IBDF set up an office at Sao Jose dos Campos.

The completion of the studies is expected in December of this year. The Group of the Remote Sensing Department of the INPE is assisting the IBDF researchers.

The project will permit a rapid registration of the necessary data, which is not achieved when conventional methods are applied.

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REMOTE SENSING: INPE CONDUCTS  
GEOLOGICAL SURVEY OF THE STATE OF SAO PAULO

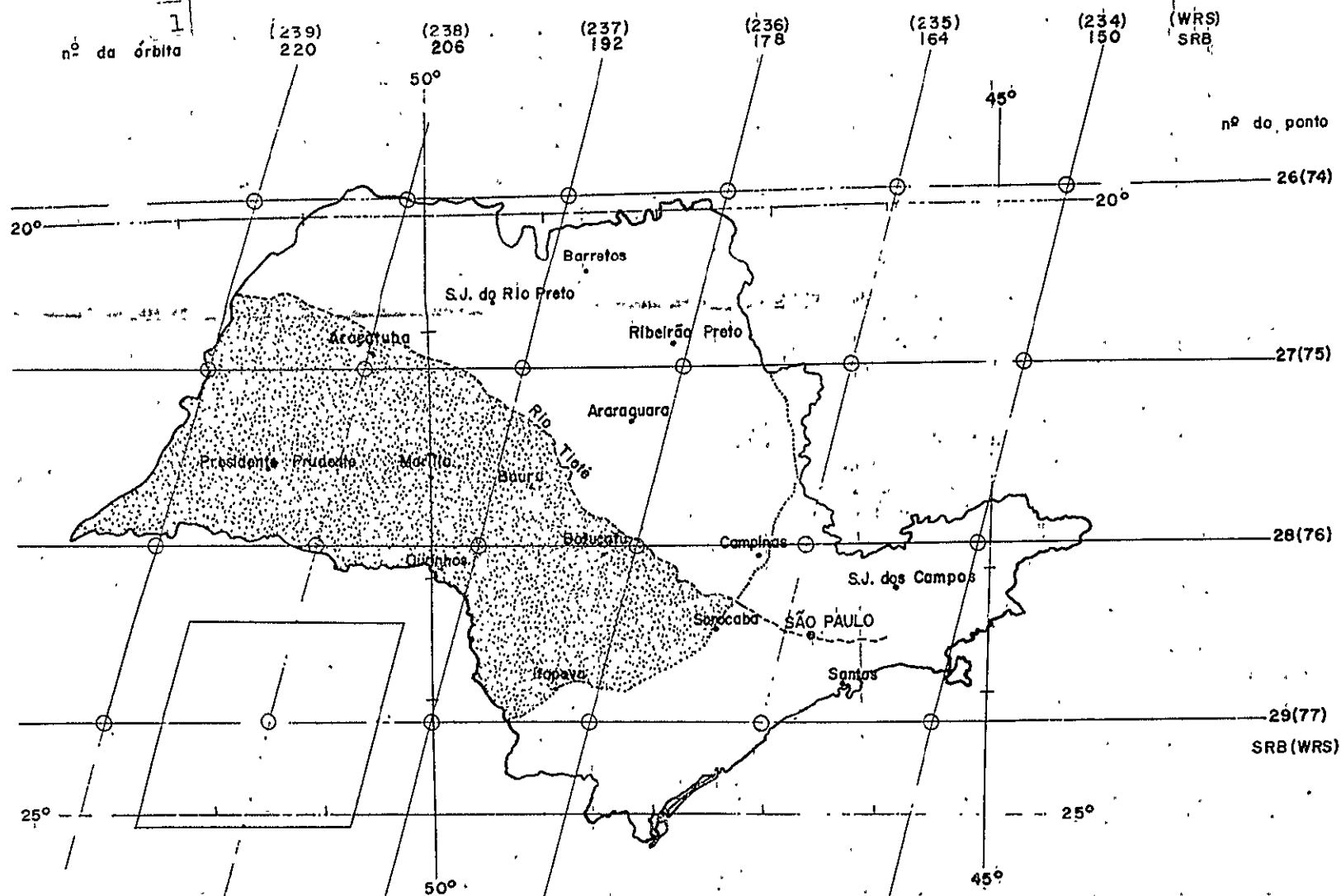
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A contract was signed between the INPE and the Institute of Technological Research (IPT) to offer their services for the creation of a drainage map of the Sandstone-Basalt Plateau, south of Rio Tiete, in the State of Sao Paulo.

Besides this map we obtained at the end of the study a photogeological structural map, on the scale 1 to 250,000, a photogeological map, also on a scale 1:250,000 and a semidetalled map of the morphostructural anomalies chosen.

The presence of sandstones and basalts, which characterizes a plateau, forms a cretacic crown which amply covers an extensive paleozoic sedimentary sequence, representing, consequently, an obstacle to investigations of pre-mesozoic lithologies and structures. It is assumed that the phanerozoic shellseed combines the best conditions of generation, migration and accumulation of hydrocarbons in the area of the South of Rio Tiete. The Geology Group of the Remote Sensing Department of the INPE (Space Research Institute), executor of the project, is using MSS/LANDSAT pictures, in the channels 4, 5, 6 and 7, RBV/LANDSAT, CCT tapes of MSS/LANDSAT, SLAR mosaics of the RADAMBRISIL project, Skylab pictures, panchromatic aerial photos and plane-altimetric maps for this survey.

The resulting maps will be used by the IPT in a series of applications of scientific interest for data on surface structures.



COVER MAP OF THE ORBITS OF THE LANDSAT SATELLITES IN  
THE-STATE OF SAO PAULO

3 SRB - Sistema de Recobrimento Brasileiro  
WRS - World Recovery System

4 Planalto Arenítico-Basáltico  
a sul do rio Tiete

Key: 1. orbit number 2. center of picture  
3. Brazilian recovery system  
4. sandstone-basalt plateau south of  
Rio Tiete

50 0 100 250 km

On the invitation of the Department of Meteorology, Dr. Stefan Ludwig Hasenrath, professor of Applied Meteorology at the University of Wisconsin, U.S.A., visited the INPE (Space Research Institute) from last July 24th to August 10th.

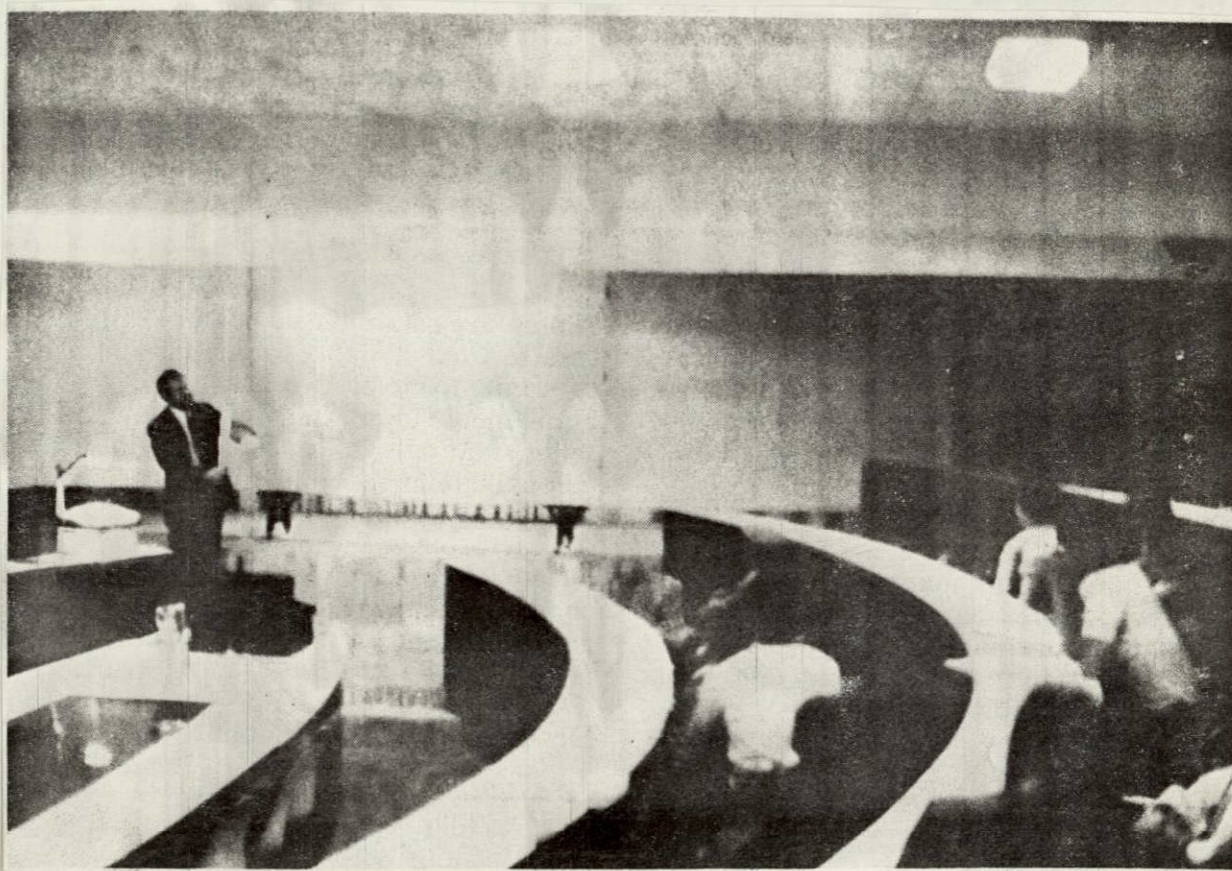
Dr. Hasenrath, an internationally acknowledged authority on climatology, counts among his achievements the organization of the El Salvador Meteorological Center.

The visit of this researcher is connected with the Semi-Arid Tropic Program of the National Council of Scientific and Technological Development. The program includes a Project for Drought Prediction, which, under the coordination of the INPE Department of Meteorology, has six projects to study the methodology of drought prediction in the northeastern region of Brazil. Besides the INPE, five other organizations are involved in this project: the Sao Paulo University, the Paraiba Federal University, the Federal University of Ceara, the Technological Center of Minas Gerais and the Ministry of Aeronautics, through the Institute of Space Activities of the Technological Aerospace Center.

Dr. Hasenrath is collecting data on the Earth's climate, starting from 1917, and extreme phenomena all over the Earth, particularly the occurrence of extreme droughts in Northeast Brazil. He has had several publications on the subject, relating to the variability of the climate, connected to these extreme phenomena. For instance, the phenomena called "El Nino" (Child) (the temperature of the sea surface on the Peruvian coasts becomes abnormally high, causing the death of fish, and considerable harm to fisheries); the variation of the Asian monsoons, and the exchange of heat by glaciers.

While at INPT, the visitor held a series of talks, among which

we may mention particularly: "Surface Circulation and Climate over the Tropical Oceans;" "Tropical Circulation and Climate Anomalies;" "Heat Budget Estimates for the Global Tropics;" "Heat Budget of the Atmosphere-Ocean-Land System;" "Brazilian Climate: a Review of Problems and Thoughts on a Research Program."



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## EIGHTH L.G.S.O.W.G. MEETING

The Eighth Meeting of the representatives of countries operating LANDSAT stations (LGSOWG), sponsored by NASA was held in the Laboratory of Earth's Resources in Slidell, Louisiana, U.S.A., from May 15th to May 17th, 1979.

Individual reports were heard from each station represented on various items of action, for example:

- specification of the Exchange Tape of the LANDSAT Data Base;
- the framework of the control of the change of CCT format;
- status of LANDSAT 2 and 3;
- status of the new LANDSAT ground stations recently proposed;
- recommendations of the Standards Committee of the Ground Control Point, a committee established to study the criterion of selection of standards for the ground control points, for the purpose of assuring precision of the geometrical correction of data.

Thereafter the discussions were aimed at individual developments, plans and recent applications associated with each station represented at the meeting. We give below a summary of the most important points: Argentina: A contract was signed to build a receiver station on the Chiquita Sea, and a processing station in Buenos Aires. The installation of the station and the beginning of the tests are expected by the end of 1979.

Australia: A reception and recording station in Alice Springs is expected to start operating in December 1979. The processing and circulation station in Canberra will, it is hoped, become operational in March, 1980. Australia plans to produce quick look pictures and single lateral band, for all the data acquired.

Brazil: The Brazilian station receives data regularly. Various application projects are under way, including the monitoring of deforestation in Amazonia, detection of probable deposits of titanium, mapping of sedimentary concentrations in a dam region, and survey of areas of sugarcane cultivation.



Canada: Canada receives data at the stations of Prince Albert and Show Cove. Some applications of LANDSAT data currently used in Canada include ice exploration maps and maps of forests and fuels.

European Space Agency: The European stations receive and record data which are processed in Fucino and then circulated to the Points of National Contact. It is noted from the Agency report that the users' requests for data are increasing.

India: The Indian station in Hyderabad is being installed and will be operational by next year. Various projects of application are being studied, relating to the investigation of the survey of water, soil and use of the land, as well as geological surveys of various states.

Japan: The reception of data started at the beginning of the year, at the Japanese station of Ohashi. An Earth Observation Center and a Technological Center for Remote Sensing are being set up in the center of the city of Tokyo, to disseminate the data and assist the users.

Zaire: Negotiations are under way to obtain financing for building a ground station. Various projects of application are being considered, including maps of soils and forests and geological studies.

The next meeting will be held in Japan, in November of this year. The Director of the Institute and the Head of the Department of Production of Pictures will be representing Brazil at this event.

In 1978, Brazil reached second place among the operator countries with regard to the data distributed (more than 18,000 LANDSAT pictures). Thus Brazil is second only to the United States as regards volume of data, and has surpassed even Canada which had always managed to retain second place.



View of Brasilia, on July 1, 1979, obtained by the Cuiaba Station of Reception and Recording, and processed by the Electronic and Photographic Laboratories in Cachoeira Paulista. Satellite: LANDSAT-3, altitude, 915 km, orbit 192, point 23, view C, RBV.

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